U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-259 806

STUDY OF THE ECONOMIC IMPACT OF SULFUR REGULATIONS PROMULGATED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY FOR OHIO ON AUGUST 27, 1976

STUDY DOCUMENT NUMBER 5. ENERGY IMPACT ANALYSIS

ENERGY AND ENVIRONMENTAL ANALYSIS, INCORPORATED,
ARLINGTON, VIRGINIA

16 SEPTEMBER 1976

EPA-905/5-76-005 323010

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2. EPA-905/5-76-005	3. PB 259 806
4. TITLE AND SUBTITLE Study Document Number 5 "Energy Impact Analysis"		5. REPORT DATE September 1976 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Energy and Environment Analysis, Inc. 1701 North Fort Myer Drive Arlington, Virginia, 22209		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-01-4101
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Air Programs Branch, Region V 230 South Dearborn Street Chicago, Illinois 60604		13. TYPE OF REPORT AND PERIOD COVERED 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
One of ten documents supporting Sulfur Dioxide Control Strategy for the State of Ohio Technical Support Document Volumes I and II EPA 905/2-76-002

16. ABSTRACT

This report is the fifth volume in support of the Inflation Impact Statement for sulfur dioxide regulations prepared by the U.S. Environmental Protection Agency, to correct deficiencies in the Ohio State Implementation Plan. The Technical Support Document, Volumes I and II may be obtained through the National Technical Information Service - EPA 905/2-76-002, PB-257 694 and PB-257 695.

This document highlights any expected changes in the pattern of fuel consumption and identifies the effects of energy penalties which result from sulfur dioxide control efforts. The impacts on energy production both within and outside Ohio are discussed.

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Energy Fuel Consumption Power Sulfur Dioxide	Coal Prices Utility Impacts Industrial Impacts Energy Impacts Cost Minimization Ohio	5C 13B

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES 29
	20. SECURITY CLASS *(This page)*	22. PRICE 4.00-3.00

EPA Form 2220-1 (9-73)

Study Document #5

Energy Impact Analysis

Part of a Study of the Economic Impact
of Sulfur Regulations Promulgated by
the U.S. Environmental Protection Agency
for Ohio on August 27, 1976

Prepared for:

Offices of Planning & Evaluation
Office of Air Quality Planning and Standards
United States Environmental Protection Agency

Prepared by:

Energy and Environmental Analysis, Inc.
1701 North Fort Myer Drive
Suite 1211
Arlington, Virginia 22209

September 16, 1976

This report was furnished to the U.S. Environmental Protection Agency by Energy and Environmental Analysis, Inc., Arlington, Virginia, in fulfillment of Contract No. 68-01-4101, Task No. 1. The contents of this report are reproduced herein as received from the contractor. The opinions, findings, and conclusions expressed are those of the author and not necessarily those of the Environmental Protection Agency.

Table of Contents

		Page
I.	INTRODUCTION	1
II.	PRESENT FUEL UTILIZATION	1
	A. Utilities	3
	B. Industrial	3
	C. Cleaned Coal	6
III.	ENERGY IMPACTS	7
	A. Overview	7
	B. Electric Utilities	7
	1. Proposed Regulations	9
	2. Final Regulations	11
	3. Energy Penalties	12
	C. Industry	14
	D. Overall Energy Impacts	17
	1. Proposed Regulations	17
	2. Final Regulations	19
APPENDIX A		20

LIST OF FIGURES AND TABLES

Table II-1 2
1972 Utility and Industrial Fuel Mix

Table II-2 4
Existing Utility Coal Consumption By Region and Sulfur Content

Table II-3 5
Present Coal Consumption -Ohio Industrial Boilers

Table III-1 8
Utility Control Option Choice

Table III-2 10
Coal Consumption at Ohio Powerplants

LIST OF FIGURES AND TABLES (Con't)

Table III-3..... 13
Energy Penalties - Utility Sector
Table III-4 15
Industrial Control Option Choice
Table III-5..... 16
Coal Supply For Ohio Industrial Boilers
Table III-6..... 18
Regional Production Effects
Figure 1
Inflation Impact Statements..... 22
Supporting Documents

I. Introduction

This paper is intended to summarize the energy impacts which can be expected as a result of promulgation of sulfur dioxide emission regulations for Ohio. The major focus of the discussion is to highlight any expected changes in the patterns of fuel consumption as well as to identify the effects of energy penalties which result from SO_2 control efforts. The impacts on energy production both within and outside of Ohio are discussed.

Ohio is a major coal producing and consuming state, ranking first in consumption and fifth in coal production in the country. Nearly all of Ohio's coal production is considered high in sulfur, with nearly 60 percent of all Ohio reserves containing at least 3 percent sulfur or more.[1/] Because of the potential for a drop in Ohio coal production resulting from regulation of sulfur emissions, shifts in the amount, quality and origin of coal consumed in Ohio were investigated. Possible changes in the pattern of fuel consumption include switching from coal to oil, switching from high sulfur coal to low sulfur coal, and increased use of coal washing or fuel blending.

II. Present Fuel Utilization

The current pattern of fuel utilization is summarized here as a baseline against which the regulatory options can be evaluated. At present, both industrial and utility boilers are highly dependent upon coal for fuel, although there is significant utilization of natural gas in industrial applications. The 1972 fuel mix in Ohio is shown in Table II-1.

1/ Coal-Bituminous and Lignite in 1974, U.S. Bureau of Mines.

TABLE II-1

1972 Utility and Industrial Fuel Mix [1/]

Fuel	Utility	Industrial[2/]	Total
Coal			
10^3 tons	40,182	12,046	52228
10^{12} BTU	897.5	317.0	1214.5
% of total BTU	96	36	67
Oil			
10^3 BBLs	3,416	14,586	18002
10^{12} BTU	20.3	82.7	103
% of total BTU	2	10	6
Gas			
MMCF	16,689	462,674	479363
10^{12} BTU	17.2	477.0	494.2
% of total BTU	2	54	27

1/ Source: U.S. Bureau of Mines, 1972

2/ Excluding coke estimated at 14,100 BTU/lb

A. Utilities

In the utility sector coal accounts for over 95 percent of all fuel use. As can be seen from Table II-2, approximately 62 percent of all coal consumed by utilities in Ohio is produced in Ohio. The rest of the coal presently used in Ohio is mostly distributed between Northern and Central Appalachia with some coal being supplied by western and midwestern production. Northern Appalachian sources in Pennsylvania and northern West Virginia provide 16 percent of current utility coal, and central Appalachian sources of eastern Kentucky, southern West Virginia and Virginia are the source of 15 percent of the current coal supply. Western states of Colorado, Utah, Montana and Wyoming provide approximately 3 percent of current utility coal, with the remaining 4 percent supplied from western Kentucky and Indiana.

Table II-2 also shows the breakdown of coal supplies by sulfur content. At present, 62 percent of all coal presently consumed by Ohio utilities is high sulfur coal. Of this high sulfur coal, over 80 percent is from Ohio production. Medium sulfur coal makes up approximately 30 percent of Ohio utility coal consumption and low sulfur coal accounts for only 8 percent of current consumption. Ohio production is responsible for approximately 37 percent of the medium sulfur coal supply, and virtually none of the low sulfur coal.

B. Industrial

Industrial coal is also largely produced in Ohio, which accounts for approximately one-half of industrial coal supplies. Table II-3 shows current coal consumption by industrial boilers by sulfur content and supply region. This table does not include data for coking coal or coal used as a process feedstock.

TABLE II-2

Existing Utility Coal Consumption
By Region and Sulfur Content[1/]
(millions of tons)

Supply Area	Low Sulfur (< 1.0%)	Medium Sulfur (1.0-3%)	High Sulfur (> 3%)	Total
Ohio	a/	5.7	25.7	31.4
Northern Appalachia	.1	3.9	4.0	7.9[b/]
Central Appalachia	2.5	4.5	.4	7.4
Western	1.6	a/	0	1.6
Other	0	.9	1.3	2.2
Total	4.2	15.0	31.4	50.5[b/]

1/ Source: FPC form 423 data for 1975
a/ Less than .05 million tons
b/ Does not total due to independent rounding.

TABLE II-3

Present Coal Consumption
Ohio Industrial Boilers
(10^3 ton/yr)

Supply Area	Low Sulfur (< 1%)	Medium Sulfur (1.0-3.0%)	High Sulfur (> 3.0%)	Total
Ohio	0	1,511	2,840	4,351
Northern Appalachia	0	424	0	424
Central Appalachia	3,207	1,134	0	4,341
Total	3,207	3,069	2,840	9,116

The data which are available with respect to industrial coal supply are limited and consequently industrial coal use has been allocated to producing regions based on coal supply by sulfur content and cost.[1/] The coal supply for industrial boilers is assumed to come from Ohio, Northern Appalachia, and Central Appalachia. Ohio is estimated to provide approximately 48 percent of the industrial coal supply, followed by Central Appalachian coal which accounts for 47 percent. Industrial boilers use generally lower sulfur coal than utility boilers, with approximately 35 percent of all coal consumed being low sulfur, and 34 percent of consumption being medium sulfur coal. Ohio provides high and medium sulfur coal, and Central Appalachia is the source for low and medium sulfur coal.

C. Cleaned Coal

In 1974 there were 17 mechanical cleaning facilities which processed approximately 19.1 million tons of raw Ohio coal to create approximately 13.6 million tons of cleaned coal.[2/] Little is known about the sophistication of these coal cleaning facilities with respect to sulfur removal capability. It has been assumed that these facilities are processing coal primarily for purposes of removal of coal refuse or gob, and not for removal of pyritic sulfur in the coal.

1/ See document #10 for details.

2/ Coal-Bituminous and Lignite in 1974, U.S. Bureau of Mines.

III. Energy Impacts

A. Overview

The energy impacts of the regulatory options will depend directly upon the mix of control technologies which are chosen for compliance as well as the stringency of the regulations. The control options considered throughout this study include:

Low Sulfur Coal
Coal Washing
Coal Blending
Flue Gas Desulfurization
Switching of Fuel from Coal to Oil

The characteristics of these technologies with respect to energy use are described in another support document. In this paper the aggregate characteristics of the regulatory options will be discussed as they affect regional levels of production.

B. Electric Utilities

The control options selected under the proposed and final regulations are presented in Table III-1. The first category of utility capacity continues to rely on its current sources of coal because these plants are either already in compliance or selecting FGD applied to existing coal or blending in new coal but continuing to use a fraction of their current fuel supplies. The remaining capacity is switching to lower sulfur coal in order to comply with applicable emission limits.

It should be emphasized that the lower sulfur coal category does not necessarily imply use of low or even medium sulfur coal. A plant may have a regulation which is not very stringent, but if the coal presently used at that plant is extremely high in sulfur, use of slightly lower sulfur coal will

TABLE III-1

Utility Control Option Choice[1/]

(Megawatts affected)

	Proposed Regulations	Final Regulations
I. Continued use of Existing Coal		
In compliance	1,000	10,100
FGD	8,300	5,000
Blending with lower sulfur coal	1,500[2/]	400
Total	10,800	15,500
II. Use of Lower Sulfur Coal from:		
Ohio	5,900[2/]	2,300[2/]
Central Appalachia	3,500[2/]	2,900
West	1,300	800
Total	10,700	6,000
TOTAL	21,500	21,500

1/ Does not include New Source Performance Standard controlled stacks.

2/ Includes use of FGD on this coal.

result in compliance, even though the new coal may also be considered a high sulfur coal.

As a result of application of the control option choices shown in Table III-1, the supply for utility coal has been calculated and is shown in Table III-2 for each regulatory option. The existing coal supply is shown in this table for purposes of comparison. The differences in the projected coal supply between regulatory options are directly related to the number of plants affected and the method used for coming into compliance.

1. Proposed Regulations

As can be seen from Table III-1 under the proposed regulations, almost all of the Ohio powerplants considered are out of compliance. One-half of the utility capacity elects to switch to a lower sulfur coal. However, the majority of capacities using lower sulfur coal obtain this coal from Ohio, much of which is lower in sulfur content as a result of coal cleaning. The number of plants which are expected to purchase coal from Western or Central Appalachian low sulfur coal markets account for approximately one quarter of the total capacity. The remaining three-quarters of the state capacity are expected to continue use of existing coal or purchase lower sulfur coal from Ohio.

The coal consumption pattern which can be expected as a result of the utility control options discussed above is shown in Table III-2. The proposed regulations appear to favor development of medium sulfur coal resources largely at the expense of high sulfur coal.

The overall demand for medium sulfur coal doubles under the proposed regulations relative to current consumption. It is expected that a large amount of this medium sulfur coal will be

TABLE III-2

Coal Consumption at Ohio Powerplants
(10^6 tons)[c/]

	Low Sulfur (<1.0%)	Medium Sulfur (1.0-3.0%)	High Sulfur (>3.0%)	Total
Current Consumption				
Ohio	a/	5.7	25.7	31.4
Northern Appalachia	.1	3.9	4.0	7.9[b/]
Central Appalachia	2.5	4.5	.4	7.4
Western	1.6	a/	0	1.6
Other	0	.9	1.3	2.2
Total	4.2	15.0	31.4	50.5[b/]
Proposed Regulations				
Ohio	a/	17.0	16.4	33.4
Northern Appalachia	a/	2.6	1.7	4.4[b/]
Central Appalachia	1.1	8.0	.1	9.2
Western	4.1	0	0	4.1
Other	0	.8	1.0	1.8
Total	5.2	28.4	19.2	52.9[b/]
Final Regulations				
Ohio	a/	6.1	25.5	31.6
Northern Appalachia	.1	3.1	3.3	6.5
Central Appalachia	2.1	5.1	.4	7.6
Western	3.7	a/	0	3.7
Other	0	.9	1.4	2.2[b/]
Total	5.9	15.2	30.6	51.7[b/]

a/ Less than .05 unit.

b/ Does not total due to independent rounding.

c/ Includes derated capacity replacement and new powerplants.

obtained by cleaning of current Ohio high sulfur coal, although some production from new mines will be necessary if Ohio is to increase production by approximately two million tons. If Ohio production cannot increase to meet such demands, the supply of medium sulfur coal would be made up from Northern Appalachia production. Western coal demand is expected to increase by almost two and one-half million tons.

2. Final Regulations

Table III-1 shows that only about half of the capacity considered is out of compliance with the final regulations. Of the capacity which is out of compliance, almost half is expected to use existing coal supplies either by use of blending or FGD. Approximately one quarter of the total capacity is expected to purchase lower sulfur coal, about 40 percent of which will be produced in Ohio. In Table III-2 it can be seen that the demand for medium sulfur central Appalachian coal is expected to increase slightly, and overall demand for Ohio coal remains at about current levels. Western low sulfur coal imports are expected to increase for blending purposes.

The primary reason why high sulfur coal production is not severely impacted under the final regulations is that much of capacity is in compliance and 40 percent of the fuel switching to low sulfur coal merely reflects switching from 5 to 7 percent coal presently used to 3 to 4 percent Ohio coal which, although still considered high sulfur, is adequate to satisfy the more lenient regulations.

3. Energy Penalties

Coal consumption is anticipated to actually increase slightly under the sulfur oxide regulations as a consequence of energy penalties. These penalties are estimated to occur as a result of derating of capacity as a consequence of power used to operate FGD and particulate control equipment and steam needed to reheat stack gases.

The increase in coal consumption levels under both the proposed and final regulations are due to the combined efforts of these energy penalties and a change in the average BTU per ton of coal as shifts occur in the regional patterns of coal supplied to Ohio. To allow for the change in heat value of coal consumption, energy penalties were calculated as a percentage of coal Btu's consumed in Ohio. As shown in Table III-3, under the proposed regulations, the energy penalty results in an increase of utility coal energy consumed of 3.9 percent. Under the final regulations, the energy penalty is only 1.5 percent due to the lesser utility capacity required to install flue gas desulfurization devices.[1/]

1/ Coal energy used in new capacity was determined as follows. First, the BTU's of coal consumed in order to generate the power required to operate pollution control devices were estimated. Second, we assumed that all new replacement capacity would be coal fired. In effect, assuming that nuclear plant plans are fixed and new nuclear capacity involves long delays to bring on line, the only viable alternative for new capacity in the early 1980's is coal fired capacity. Third, an allowance was made for the more efficient heat rates of new plants. Thus, BTU's of coal for replacement plants estimated above was reduced by multiplying by the ratio of heat rates of new versus existing plants assuming 9,000 BTU's per kWh as the new plant heat rate. Finally, the resultant BTU's coal demand was converted to tonnage demands assuming new plants had the same mix of supply sources by region as existing plants under the two regulatory scenarios. The last judgement is arbitrary since the choice of control strategies (FGD vs. low sulfur coal) for replacement capacity subject to Federal New Source Performance Standards was not included in the scope of this study.

TABLE III-3
Energy Penalties
Utility Sector

	Proposed	Final
Energy Penalty,[a/]		
10^{12} Btu	43.2	16.5
Percent of Base		
Btu (Utility)	3.9	1.5

a/ Includes steam penalty plus derated capacity replacement requirements.

Coal cleaning is associated with loss of a certain percentage of the coal processed. If coal cleaning increases under the sulfur regulations, then coal production would rise more than consumption levels reported in Table III-2 for Ohio plants. Coal cleaning is significant in the regulatory cases only for medium sulfur coal from Ohio and Pennsylvania production. Available data indicates that current coal cleaning results in 71 percent recovery of the raw coal weight, and a study of coal washability suggests that this weight recovery level corresponds to 75 to 80 percent Btu recovery.[1/] The Btu recovery rate of coal cleaned for purposes of sulfur removal is not as good as that for inorganic substance removal. Use of a 70 percent weight recovery rate will provide a rough estimate of the level of production which is represented by the cleaned coal.

In the case of the final regulations, the total quantity of coal which is washed for sulfur removal is approximately one-half millions tons which corresponds to approximately three quarter million tons of raw coal. This is in addition to the approximately 19 million tons of raw coal already cleaned in Ohio. The coal lost at this level of cleaning (e.g., specifically the coal cleaning for sulfur removal) represents approximately 0.5 percent of the existing coal consumption.

C. Industry

In the industrial sector, all possible control options were considered except coal blending. Coal blending is not considered because industrial installations are typically too small to justify blending facilities. The control options which were chosen under the two regulatory scenarios are shown in Table III-4. As can be seen from this table, and Table III-5 which shows the expected coal supply distribution for each alternative, the main effect of SO_2 regulations in the industrial sector will be an increase in the demand for Central Appalachian low sulfur coal and a reduction in the demand for current coal supplies.

1/ U.S. Bureau of Mines, Sulfur Reduction Potential of the Coals of the United States, RI 8118, 1976.

TABLE III-4

Industrial Control Option Choice

(10^{12} Btu energy consumption)

	Proposed Regulations	Final Regulations
In compliance	162.5	172.5
Out of compliance	125.6	115.7
1. Fuel Combustion Boilers		
FGD	0.6	0.0
LSC	114.3	114.9
Oil	-	0.4
2. General Process		
FGD	0.0	0.3
LSC	10.7	0.0

TABLE III-5

Coal Supply for Ohio Industrial Boilers

(10^3 ton/yr)

Supply Area	Low Sulfur (< 1.0%)	Medium Sulfur (1.0-3.0%)	High Sulfur (> 3%)	Total
Current Consumption				
Ohio	0	1511	2840	4351
Northern Appalachia	0	424	0	424
Central Appalachia	3207	1134	0	4341
Total	3207	3069	2840	9116
Proposed Regulations				
Ohio	0	3262	545	3807
Northern Appalachia	0	145	0	145
Central Appalachia	3919	1240	0	5159
Total	3919	4647	545	9111
Final Regulations				
Ohio	0	1550	1713	3263
Northern Appalachia	53	173	0	226
Central Appalachia	5204	411	0	5615
Total	5257	2134	1713	9104

The demand for high sulfur coal is reduced significantly under both options, from a current value of approximately 2.8 million tons per year to 0.5 million tons under the proposed regulations and 1.7 million tons for the final regulations. Ohio and Northern Appalachian coal supplies are the most affected by the regulations, although demand for Ohio medium sulfur coal is increased by the proposed regulations. This demand could possibly be met by cleaning present coal. An overall reduction in total demand for Ohio coal is projected, varying from 0.5 million tons for the proposed regulations to one million tons per year for the final regulations.

The total coal demand does not change significantly, although one facility is projected to switch from coal to oil as a result of the final regulations. A slight overall reduction in total coal demand is projected, which is due to slight variations in assumed heat content between Ohio coal and Central Appalachian coal. Since application of flue gas desulfurization devices is negligible for industry, there are no energy penalties.

D. Overall Energy Impacts

The overall coal consumption for Ohio utility and industrial facilities is estimated to remain constant or even to increase slightly as a result of implementation of the sulfur oxide regulations as shown in Table III-6.

1. Proposed Regulations

Under the proposed regulations, the coal demand for all supply regions except Northern Appalachia, Indiana and Western Kentucky, is expected to rise, with Ohio coal demand expected to rise by 1.4 million tons, or 3.1 percent of current total production. Central Appalachian coal demand is expected to rise by 2.7 million tons which represents approximately 1.5 percent of the

TABLE III-6

Regional Production Effects

Region	1974[1/] Production (10^6 tons)	Current Sales to Ohio	Proposed Regulations: Sales to Ohio	Proposed Regulations: Difference	Proposed Regulations: % Change in Regional Production	Final Regulations: Sales to Ohio	Final Regulations: Difference	Final Regulations: % Change in Regional Production
Ohio	45.4	35.8	37.2	+1.4	3.1	34.9	-.9	-2.0
Northern Appalachia	125.4	8.3	4.5	-3.8	-3.0	6.7	-1.6	-1.3
Central Appalachia	186.1	11.7	14.4	+2.7	1.5	13.2	+1.5	0.8
Western[2/]	48.4	1.6	4.1	+2.5	5.2	3.7	+2.1	4.3
Other[3/]	75.6	2.2	1.8	- .4	-.5	2.2	0	0
U.S. Total	603.4	59.6	62.0	+2.4	.4	60.8[4/]	+1.2[4/]	0.2

1/ Source: U.S. Bureau of Mines, Coal, Bituminous and Lignite in 1974.
2/ Colorado, Montana, Utah, Wyoming
3/ Western Kentucky and Indiana
4/ Does not total due to independent rounding.

sents approximately a three percent reduction in coal demand from this region. This reduction could possibly be offset if washing of Ohio production cannot be increased as estimated. Coal BTU's consumed in Ohio facilities are projected to increase by 3.3 percent as a consequence of installation of FGD on utility power plants.

2. Final Regulations

The impacts of the final regulations on coal production reflect the lesser stringency of the regulations. The total demand is estimated to increase by about 1.2 million tons, distributed between Western sources and Central Appalachian low sulfur coal. Northern Appalachian demand declines by 1.6 million tons, which is approximately 1.3 percent of current production. Imports of Western coal are expected to more than double, which represents an increase of about 4.3 percent over existing production levels. Demand for Ohio coal is reduced by approximately 900,000 tons, which is equivalent to about a 2.0 percent decline. The decline in Ohio coal use in comparison to the proposed regulation is due to the drop in demand for washed Ohio coal and the reduction in the energy penalty on total utility and industrial coal use from 3.3 percent to 1.3 percent.

Preceding page blank

APPENDIX A

INFLATION IMPACT STUDY DOCUMENTATION

This appendix identifies the documents prepared to support the Inflation Impact Analysis of the sulfur oxide regulations prepared by the U.S. Environmental Protection Agency (EPA) for the state of Ohio.

Figure 1 identifies the supporting documents. Document #2 provides an overview of the study methodology and illustrates the depth of analysis contained in the study.

Impact Studies

Documents #3 and 4 are economic impact analyses of the utility and industrial sectors in Ohio. These reports address impacts on prices, output, employment and financial viability. Document #5 summarizes the energy impacts of the regulation in terms of the level of energy demand, shifts from coal to oil likely to occur as a result of compliance with the regulations as well as shifts in coal production patterns. In particular, this report focuses on whether coal production in Ohio, which is generally high in sulfur content, will be adversely impacted.

Cost Minimization

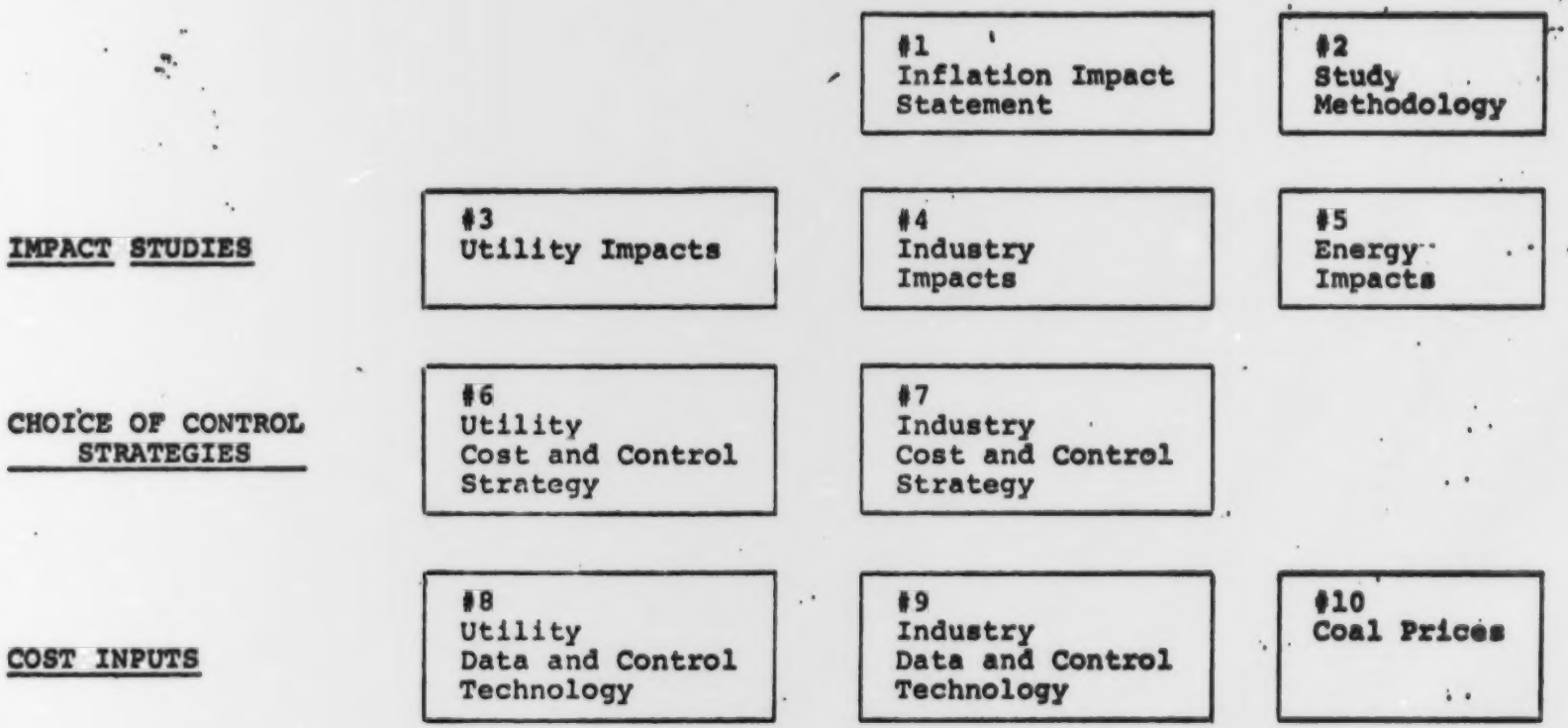
Documents #6 and 7 present the methodology for estimating costs of compliance and the choice of pollution control strategies. For both utility and industry, these supporting documents outline the cost minimizing strategies which provide the basis for the economic and energy impacts discussed in documents #3 - 5.

Cost Inputs

These final documents contain the basic data inputs to the study. Document #8 describes the pollution control technology options, their costs plus basic plant specific parameters which influence costs such as fuel consumption and boiler firing rates.

Figure 1

INFLATION IMPACT STATEMENTS SUPPORTING DOCUMENTS



Document #9 contains similar data on the industrial sector. Document #10 presents the derivation of coal prices employed in this study and used in both the industry and utility sector analysis. The focus is on the price premium of low versus high sulfur coal.